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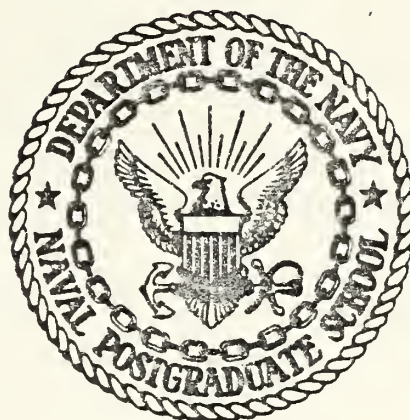
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EFFECTIVENESS OF NAVY ADVERTISING

Thomas Cloud Williams

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

EFFECTIVENESS OF NAVY ADVERTISING

by

Thomas Cloud Williams, Jr.

September 1978

Thesis Advisor: James K. Arima

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This analysis was performed to evaluate the effectiveness of Navy recruiting advertising in producing fully qualified, first-term enlistments during calendar years 1976 and 1977. Advertising expenditures and enlistment data were allocated to the county level by month. Advertising expenditures for the general enlisted program included national media,

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local advertising by recruiting districts, and the recruiting aids utilized
by recruiting districts. The total enlistements and the enlistments of
high school graduates (HSG) scoring above the 50th percentile on the Armed
Forces Qualification Test (AFQT50) were also aggregated by county by month
as measures of the quantity and the quality of enlistments. Recruiter
goals, the number of recruiters, the number of Qualified Military Available
(QMA), the number of high school graduates, and the unemployment rate were
also included. All of the variables, except unemployment rate, were normal-
ized for the QMA. Cases from December 1976, with zero enlistments, and
with enlistment rates (total enlistments per QMA) exceeding .005 were con-
sidered outliers and not included in the study. A fourth root transforma-
tion of advertising was made to permit fitting the data to a linear, least
squares model. Stepwise multiple regression of enlistments per QMA on the
independent variables resulted in a significant R squared of .556 in which
local advertising during the current month and recruiting aids lagged two
months played the most significant parts. When the HSG/AFQT50 enlistments
were used as the dependent variable, a R squared of .737 resulted with the
same advertising variables as above the most significant. The results
demonstrated the importance of the amount, type, and timing of advertising.
Apparently excessive amounts of advertising weaken the relationship between
advertising and enlistments. The proportion of high school graduates to the
QMA in a county was a significant determinant of the enlistment rate, but
the proportion of recruiters and the proportion of the monthly recruiters'
goal to the QMA, as well as the unemployment rate, were not.

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Effectiveness of Navy Advertising

by

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Lieutenant, United States Navy
B. S., New Mexico State University, 1968

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN OPERATIONS RESEARCH

from the

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September 1978

ABSTRACT

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media, local advertising by recruiting districts, and the recruiting
aids utilized by recruiting districts. The total enlistments and the
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county was a significant determinant of the enlistment rate, but the
proportion of recruiters and the proportion of the monthly recruiters'
goal to the QMA, as well as the unemployment rate, were not.

SUMMARY

Problem

Analysis to measure the effectiveness of Navy advertising has been
concerned with such data as the number of calls to a toll-free number or
the responses to questionnaires by walk-ins to a recruiter's office.
However, analysis has not been devoted to determining the effectiveness of
advertising expenditures in producing enlistments, which is comparable to
civilian firms trying to budget advertising expenditures optimally for sales.
This need to determine the effectiveness of advertising in producing en-
listments is a part of the overall problem of sustaining the All Volunteer
Force at an acceptable cost.

Objective

The objective of this analysis was to determine the degree of relation-
ship between naturally occurring advertising and enlistment data (historical
data from calendar years 1976 and 1977), controlling for the important
managerial, demographic, and socioeconomic variables. Advertising data was
lagged to determine if a carryover effect existed between advertising in
the past and current enlistments.

Approach

The approach taken in this analysis was to aggregate all data at a low
level, the county, within a short time interval, the month, to permit a
microanalysis approaching the individual decision to enlist. Fully quali-
fied, first-term enlistments each month in each county during calendar
years 1976 and 1977 were included. Total enlistments and the enlistments

of high school graduates scoring above the 50th percentile on the Armed Forces Qualification Test (HSG/AFQT50) were used to measure both the quantity and the quality of the enlistments. National media advertising, Local Advertising Management System (LAMS), and Recruit Advertising Department (RAD) aids expenditures for the general enlisted program were included. Recruiter goals (Q goals), the number of recruiters, the number of Qualified Military Available (QMA), the number of high school graduates, and the unemployment rate were non-advertising variables included in the study. Single equation, linear, least squares models were fitted to the data at the county-monthly level to determine the significance of the advertising and non-advertising variables. All variables except the unemployment rate were normalized with the QMA yielding enlistment rate models (enlistments per QMA).

Results

1. Media and RAD aids advertising two months prior to the month of an enlistment and media and LAMS advertising during the month of an enlistment were the most significant advertising expenditures in the enlistment rate models.

2. The sum of the media, LAMS, and RAD aids expenditures for advertising was not a positive contributor to the enlistment rate of quality enlistees, while each advertising type individually was a positive contributor.

3. Excessive advertising rates were found in counties where enlistment production rates were high. A fourth root transformation of advertising was required to make the relationship between enlistment rate and advertising rate linear.

4. The proportion of high school graduates to QMA in a county was one of the significant determinants of the enlistment rate.

5.   The proportion of recruiters to QMA and the national unemployment rate were not significant factors in the determination of the enlistment rate.

6.   The county's monthly goal of enlistees being sent to recruit training, the Q goal, did not enter the regression equation due to its insignificance.

Conclusion

Navy advertising was effective as one of the determinants of the enlistment rate, enlistments per QMA. The amount of advertising, the type of advertising, and the timing of advertising were important aspects of advertising which affected its contribution to the enlistment rate. Media and RAD aids expenditures two months prior to an enlistment and media and LAMS expenditures the month of an enlistment were the significant advertising expenditures found in this study. The model used in the study does not provide a definitive determination of the direction of the effect between enlistments and advertising, whether advertising resulted in enlistments or expected enlistments resulted in advertising.

Recommendations

1.   Data directly from the county-monthly level is needed to replace the LAMS, RAD aids, Q goals, and recruiters estimated from data at the Naval Recruiting District Level. The unemployment rate should also be determined at some level below the national rate used in this study.

2.   The effectiveness of each of the national media categories, (television, radio) should be examined as a result of the significance of total media advertising found in this study.

3.   A model is needed which includes the cases of zero enlistments excluded by this study.

4. The Delayed Entry Program (DEP) pool should be included as a factor in addition to the Q goal which drives enlistments.

5. Analysis with appropriate models is required to determine the direction of influence between advertising and enlistments.

6. The optimal relationship between advertising expenditures and the potential of a territory as measured by an indicator such as the Recruitment Development Index (RDI) requires investigation.

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I. INTRODUCTION

A. PROBLEM

Analysis to measure the effectiveness of Navy advertising has been concerned with such data as the number of calls to a toll-free number or the responses to questionnaires by walk-ins to a recruiter's office. However, analysis has not been devoted to determining the effectiveness of advertising expenditures in producing enlistments, which is comparable to civilian firms trying to budget advertising expenditures optimally for sales. This need to determine the effectiveness of advertising in producing enlistments is a part of the overall problem of sustaining the All Volunteer Force at an acceptable cost.

B. PURPOSE — objective

The purpose of this analysis was to determine the degree of relationship between naturally occurring advertising and enlistment data (historical data from calendar years 1976 and 1977), controlling for the important managerial, demographic, and socioeconomic variables. Advertising data was lagged to determine if a carryover effect existed between advertising in the past and current enlistments.

C. BACKGROUND

The All Volunteer Force has been responsible for a major impact on military recruiting. The Navy recruiting organization is no longer able to passivly screen potential recruits forced to enlist by the draft. Today the Navy must actively compete with civilian firms as well as the other military services for qualified personnel in the necessary quantities

to maintain existing force structures. To be successful at attracting and enlisting personnel in the labor market, the Navy recruiting organization must function as a marketing and sales organization to sell enlistment programs.

Just as advertising plays an important role in the marketing and sale of civilian products and employment opportunities, advertising has become significant as a tool of the Navy's marketing and sales organization within recruiting. The Navy spent over 16 million dollars for advertising in fiscal year 1977 and has budgeted 18 million dollars for advertising in fiscal year 1978 in comparison with only 2 million dollars for advertising in fiscal year 1971 before the All Volunteer Force.

Navy advertising is directed toward three objectives. First, it should influence those potential enlistees not considering the Navy for employment, and prompt them to seek information from a recruiter about available enlistment programs. Second, for those interested in the Navy, advertising should support the recruiter's efforts to influence a potential enlistee's propensity to enlist for a particular program for which he is qualified. Finally, advertising and a recruiter should work to meet the most important objective of any marketing effort, the sale, which in this case is an enlistment. Therefore, to be considered effective, advertising should contribute to the third objective as well as to the first two so often considered in previous studies.

The Navy Recruiting Command (NRC) is responsible for recruiting and its associated advertising. The Recruiting Advertising Department (RAD) of the Navy Recruiting Command actually plans and directs the Navy advertising program. The General Enlisted Program receives about half of the total advertising budget with lesser shares to re-enlistment and

retention programs, reserve enlistment programs, specialty enlistment programs (nuclear and electronics), and officer enlistment programs. The Navy advertising budget is not only allocated among enlistment programs but also divided into three functional categories: (1) national media advertising, (2) Local Advertising Management System (LAMS), and (3) Recruiting Advertising Department (RAD) recruiting aids. National media advertising is prepared and distributed under contracts with civilian advertising agencies such as Ted Bates, Inc., New York. National media advertising consists of advertising for television, radio, magazines, mail-outs, outdoor billboards, and newspapers. LAMS and RAD advertising funds and materials are allocated to the six Navy Recruiting Areas (NRA) and the forty-three Navy Recruiting Districts (NRD) of the Navy Recruiting Command. LAMS allocations are requested from the Navy Recruiting Command by each Navy Recruiting District with the approval of its Navy Recruiting Area for use in local advertising such as school newspapers, programs for local events, and for individual recruiter advertising such as mail-outs. RAD aids include printed material, promotional items such as pens, matches, desk organizers, and briefcases, spot films for television, and sound tracks for radio used at the recruiter level. These recruiting adis are designed by the Recruit Advertising Department and produced under contract by a civilian firm in most cases. Table I shows the expenditures for the General Enlisted Program for the three categories of advertising.

TABLE I

GENERAL ENLISTED PROGRAM EXPENDITURES

YEAR	MEDIA	LAMS	RAD	TOTAL
1976	3,916,371	1,122,320	6,288,036	11,326,727
1977	5,803,669	1,333,629	8,752,187	15,889,485

The need for a determinant of the effectiveness of advertising has prompted research by civilian and military marketing analysts. Though agreeing effectiveness should be measured and the question, "How much advertising is enough?", answered, researchers cannot agree on how effectiveness should be measured. One group of researchers has seen advertising as a communication process without being concerned about a change in attitude or an initiation of any action by the target audience. A second group of researchers has focused on the change in attitude as a result of advertising. Finally, a third group of researchers has been concerned with the effect of advertising on the sale of products.

The military analysis of advertising has consisted of attempts to measure both the communication of its advertising and any resulting attitude changes through surveys and questionnaires. The Stanford Research Institute, in research for the Army [Ackerman, Mason and Vollmer 1971], and the Air Force Human Resources Lab [Vitola, Mullins and Williams 1974] have analyzed the responses by high school students and walk-ins to a recruiter's office. They wished to determine the effect of each media type and their relative impact versus other recruiting aids. Rhodes Associates (1978) has completed a similar study for the Navy using data from the Market Facts Survey of 1974 to measure the effect of advertising

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on the propensity to enlist. However, the military has not yet done re-
search on the effect of advertising on the sale of its product, namely,
enlistments.

Advertising is only one of the many factors which influence the sale
of a product. Therefore, controlled experiments with advertising have
been tried in addition to the analysis of advertising as it interacts
naturally with these other factors. Neither the controlled experiments
nor the studies of naturally occurring sales data have been completely
successful in showing the effects of advertising. A controlled experiment
by Anhauser-Busch from 1962 to 1968 excluded many factors other than ad-
vertising, but the results showed no significant effects on sales due to
advertising [Ackoff and Emshoff 1975]. The research using naturally oc-
curring sales data have met with difficulty trying to account for the
factors at work in addition to advertising. Regression analysis dominates
the research done with data from naturally occurring sources. For example,
Palda (1964) was successful with a single equation regression model which
included lagged advertising to explain current sales. However, Quandt
(1964) found the single equation model inadequate in his research, and he
is suspicious of the results of any regression model to explain the effect
of advertising. The simultaneous equation models which have been developed
seem better suited to the complexity and interaction in the sale of a pro-
duct. Aaker and Day (1974) developed a three equation model with aware-
ness, attitude, and market share as the dependent variables. Bass (1969)
included competing products in his analysis of cigarette sales with a
simultaneous equation model.

While not completely successful, the civilian analysts have found regression analysis a useful approach to measure the effectiveness of advertising as it relates to sales. Military advertising studies have used regression analysis but not with enlistment data. Therefore, it seems logical to extend the regression analysis of advertising to include enlistments. This study will concern itself with single equation models to relate enlistments and advertising.

II. METHOD

A. SCOPE OF THE STUDY

This study was completed with data from the period 1 January 1976
to 31 December 1977. All enlistment and advertising data from this period
was aggregated according to its month and county. The county was identi-
fied by the FIPS code, a five-digit code assigned to each county. Alaska,
Samoa, the Canal Zone, Guam, Puerto Rico, and the Virgin Islands were ex-
cluded from the study. Cities with separate FIPS codes were combined
under the county's FIPS code, because the advertising data were available
for the county only. The deletions and combiations resulted in 24 monthly
data groups for each of 3,074 counties.

In addition to enlistments and advertising, data on the following re-
cruiting and socioeconomic variables were collected: The monthly Q goal
(the number of enlistees to be sent to recruit training) and the number
of production recruiters (canvassers) for each Navy Recruiting District;
the Qualified Military Available (QMA) and the number of high school grad-
uates in each county; and the unemployment level each month of 1976 and
1977. A complete discussion of each element of data follows this intro-
duction.

Two measures of effectiveness were used in this study. First, the
total number of fully qualified, first-term enlistees was used as a
measure of the quantity of the enlistments. Second, the number of en-
listees who were high school graduates (HSG) scoring above the 50th per-
centile on the Armed Forces Qualification Test (AFQT50) was used as a
measure of the quality of the enlistments.

A linear, least squares model fitted to the data was used to determine the significance of advertising in the enlisting of personnel with these two measures of effectiveness. This model was of the following functional form:

Enlistments = f(Advertising, Goals, Canvassers, Graduates, QMA, Unemployed).

This model was normalized by dividing all variables by QMA, making the dependent variable an enlistment rate. This rate of enlisting was thought to be a better indicator of recruiting effectiveness when considering counties of such varying sizes. The modification also helped eliminate a multicolinearity problem among the independent variables resulting from the use of QMA by the recruiting command to allocate all recruiting resources. The enlistment rate model used in the analysis was of the form:

$$\frac{Enlistments}{QMA} = f(\frac{Advertising}{QMA}, \frac{Goals}{QMA}, \frac{Canvassers}{QMA}, \frac{Graduates}{QMA}, UnemploymentRate).$$

B. DATA IN THE STUDY

1. Enlistments

Monthly enlistment data was obtained from extracts from the USAREC DOD Edited Files of 1 January 1976 to 28 February 1978 by the Defense Manpower Data Center, Monterey, California. The following criteria were used to select enlistees from this file:

1. Navy
2. No prior service
3. Fully qualified
4. Enlisting into active duty or into Delayed Entry Program (DEP).

Then coded information on each of these enlistees was extracted as follows:

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1. Home of Record – State
2. Date of Enlistment
3. Highest Year of Education
4. Sex
5. Race
6. AFQT Percentile
7. Home of Record – County.

The FIPS code for the county given as home of record by each en-
listee was formed by combining the code for the home of record (state)
and the home of record (county). The month of enlistment for each en-
listee was determined from the date of enlistment, which is the date he
signed the enlistment contract (pay entry base date). Knowing the month
and county of each enlistment, total monthly enlistments were determined
for each county for each month of 1976 and 1977. In addition, the sex,
race, highest year of education, and AFQT percentile of each enlistee
were used to divide the monthly enlistments in each county into subgroup-
ings such as males, females, majority, minority, high school graduates,
and AFQT percentile greater than 50. Table II shows the monthly enlist-
ments for the 24 months covered in the study.

2. Media Advertising

Monthly media advertising for each county was obtained from the
NRD Media Allocation Report of 2 February 1978 prepared by Ted Bates and
Company, New York, New York. Expenditures for the General Prime (Majority)
Program for the following media categories were extracted from the report:

1. Television
2. Radio
3. Magazines
4. Direct Mail
5. Outdoor
6. Newspaper
7. Newspaper Supplements
8. Total County Expenditure.

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TABLE II

MONTHLY ENLISTMENTS

YEAR	MONTH	TOTAL ENLISTMENTS	HIGH SCHOOL GRADUATES	GRADUATES ABOVE 50TH %
1976	Jan.	9,021	5,834	4,175
	Feb.	7,897	5,114	3,765
	March	8,138	5,612	4,218
	April	6,666	4,650	3,471
	May	5,834	4,209	3,131
	June	7,067	5,553	3,813
	July	7,531	5,691	4,173
	Aug.	7,761	5,886	4,346
	Sept.	8,207	5,927	3,991
	Oct.	7,891	5,459	3,612
	Nov.	9,098	6,132	4,449
	Dec.	16,457	11,291	8,147
1976	Total	101,568	71,358	51,309
1977	Jan.	7,025	4,703	3,194
	Feb.	7,191	4,651	3,172
	March	7,764	4,990	3,489
	April	6,332	4,073	2,886
	May	5,900	3,818	2,738
	June	7,633	5,154	3,461
	July	7,852	5,213	3,483
	Aug.	8,677	5,616	3,809
	Sept.	7,443	4,374	2,989
	Oct.	5,951	3,741	2,651
	Nov.	6,927	4,033	2,904
	Dec.	6,861	3,836	2,719
1977	Total	85,556	54,202	37,495

Table III shows the monthly expenditures for each of the media categories. There were no expenditures for advertising in newspapers or newspaper supplements for the general majority program, so these two media categories were not included in this study. The expenditures for each media category were allocated monthly to a county in accordance with the following techniques.

The television allocation was based on the A. C. Nielsen Company's determination of the distribution of total impressions (men 18 to 34) for a particular program to each station airing the program. The cost of the program was distributed to each station according to their proportion of the total impressions. The expenditure for each county was proportioned according to Nielsen's percentage of average viewing hours by county for each station.

In a similar manner the expenditures for radio advertising were proportionally distributed to each county. The ARB (Advertising Research Bureau) male impressions per station were used to distribute the cost of programs to each station. The Pulse, Inc., percentage of male listening audience by county per station was used to allocate the station cost to each county. In the case of new radio stations not in the Pulse calculations, that station's costs were distributed directly to the county in which the station was located. This procedure was used for both network and spot radio costs.

Magazine advertising was distributed according to the ABC (Audited Board of Circulation) Supplemental Report on county circulation or in some cases according to circulation data supplied by the publisher. In the case of limited distribution magazines, such as programs for special events, expenditures were distributed directly into the county of the event.

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TABLE III

MONTHLY MEDIA EXPENDITURES

YEAR	MONTH	TOTAL	MAGAZINE	MAIL	TELEVISION	RADIO	OUTDOOR
1976	Jan.	232,952	102,954	129,998			
	Feb.	149,256	62,668	86,588			
	March	155,366	143,573	11,792			
	April	381,564	295,914	85,650			
	May	409,182	151,165				258,017
	June	536,529	261,301				275,228
	July	513,370	235,726				277,644
	Aug.	494,833	214,495				280,338
	Sept.	283,165	261,009	650			21,506
	Oct.	223,659	223,009	650			
	Nov.	515,880	133,115	192,485		190,280	
	Dec.	20,615	19,965	650			
1976	Total	3,916,371	2,104,894	508,463		190,280	1,112,733
1977	Jan.	392,297	168,545	142,016		81,737	
	Feb.	297,700	133,650	650		163,400	
	March	192,603	109,686	650		82,267	
	April	854,072	36,686	128,208	288,306	112,574	288,299
	May	1,020,599	31,648	650	400,594	299,119	288,588
	June	368,934	4,013	675	128,801	235,271	174
	July	314,151		675		313,248	229
	Aug.	246,065	2,639	675		242,577	174
	Sept.	317,613	3,887	675	188,973	124,079	
	Oct.	1,111,848	51,978	253,070	495,634	311,166	
	Nov.	672,273	18,679	675	402,693	250,226	
	Dec.	15,514	14,838	675			
1977	Total	5,803,669	576,249	529,294	1,905,001	2,215,664	577,464

Expenditures for outdoor advertising were taken from the VCS (Visual Campaign Summary) and allocated to each county based on the county's percent of total QMA (Qualified Military Available). The QMA used here was from the Recruitment Development Index for July 1975 to June 1976.

Finally, direct mail counts by zip code for mailings in October 1977 were used to prorate direct mail expenditures for the entire period. The Zip-O-Data tape was used to assign zip codes to the appropriate county. The expenditures by county were than determined with inputs from the direct mail distributor.

3. LAMS and RAD Expenditures

Local Advertising Management System (LAMS) and Recruit Advertising Department (RAD) expenditures were obtained from the quarterly reports of the Navy Recruiting Command. Since this data was only available quarterly for each of the 43 Navy Recruiting Districts, a method was devised to allocate the expenditures to each county monthly. The allocation was made by first grouping the counties according to NRD. Due to two changes in the assignment of counties to NRDs in July 1976 and October 1977, all counties did not remain in the same NRD for the two years investigated. The quarterly LAMS and RAD expenditures by each NRD were then divided equally among the three months in a quarter. These monthly totals for each NRD were then apportioned to every county in the NRD according to its number of Qualified Military Available (QMA), the number of eligible men in the county between the ages of 17 and 24. (The source of the QMA for each county is discussed below.) Thus, each county received its LAMS and RAD allocation for the month according to the following:

$$\frac{\text{Quarterly NRD Expenditure}}{(3 \times \text{Total QMA in NRD})} \times \text{QMA in County}.$$

Table IV shows the LAMS and RAD expenditures for each quarter. RAD data was not available for the quarter, 1 January 1976 to 31 March 1976. Instead RAD data for the period 1 January 1976 to 30 June 1976 was allocated as stated above, except the division was into six equal monthly expenditures for each NRD instead of three.

4. QMA and High School Graduates

The Qualified Military Available (QMA) and the annual number of high school graduates in each county were available from the Recruit Marketing Network of the Defense Manpower Data Center, Monterey, California. As previously stated, the Qualified Military Available is the number of eligible men in each county between the ages of 17 and 24. The QMA, totalling 13 million, is from an update completed in 1977, while the number of high school graduates, totalling 3 million, is from the year 1976. The QMA and the number of high school graduates remained constant for each county for all 24 months of the study.

5. Q Goal and Canvassers

Every Navy Recruiting District (NRD) is assigned a monthly goal of enlistees to be sent to recruit training. This goal, called the Q goal, along with the number of recruiters, or canvassers, in each NRD is reported in the Navy Recruiting Command monthly report. As was done with the LAMS and RAD expenditures, the Q goal and canvassers within each NRD were apportioned to each county in each NRD according to the county's QMA. Thus, the Q goal and the number of canvassers for a county were determined by

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TABLE IV

QUARTERLY LAMS AND RAD EXPENDITURES

YEAR	QUARTER	LAMS	RAD
1976	1	186,405	
	2	426,713	2,894,921
	3	302,799	1,065,084
	4	206,403	2,328,031
1976	Total	1,122,320	6,288,036
1977	1	260,360	2,471,120
	2	302,520	4,658,691
	3	329,100	820,212
	4	441,649	802,164
1977	Total	1,333,629	8,752,187

the following:

$$\frac{\text{Monthly Total for NRD}}{\text{Total QMA in NRD}} \times \text{QMA in each County.}$$

Table V shows the monthly Q goal and canvassers.

6.   Unemployment

The monthly unemployment percentages used in this study are for
both sexes ages 16 to 19. They are national, seasonally adjusted percentages
from the U. S. Bureau of Labor Statistics Bulletins on Employment and Earn-
ings of January 1977 and January 1978. No attempt was made to determine the
actual percentage for each county or for any aggregation below the national
level. Therefore, the unemployment percentage is the same for all counties
each month. Table V shows the unemployment percentages used in this study.

C.   EXPLORATORY ANALYSIS

1.   Enlistments

Three subsets of the monthly county data groups were deleted from
the study as a result of exploratory analysis of the enlistment data prior
to model formulation. These subsets were the cases from December 1976,
the cases in which the total monthly enlistments in a county were zero,
and the cases with exceptionally high enlistments per QMA rates. First,
the enlistments from December 1976 (shown in Table II) were more than
twice the expected number when compared with the months before and after
or compared with December 1977. This increase was attributed to the dis-
continuation of GI Bill benefits to anyone enlisting after 31 December
1976. It is impossible to know the impact of the discontinuance of the
GI Bill on enlistments before December 1976. Enlistments in October and
November 1976 were 30 percent higher than they were in 1977; however, this

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TABLE V

MONTHLY Q GOAL, CANVASSERS, AND UNEMPLOYMENT

YEAR	MONTH	Q GOAL	CANVASSERS	UNEMPLOYMENT PERCENTAGE
1976	Jan.	5,953	3,241	19.9
	Feb.	4,943	3,236	19.2
	March	4,631	3,215	19.1
	April	4,293	3,178	19.2
	May	4,935	3.147	18.5
	June	7,765	3,158	18.4
	July	9,500	3,179	18.1
	Aug.	9,500	3,236	19.7
	Sept.	9,500	3,266	18.6
	Oct.	7,992	3,221	19.0
	Nov.	6,216	3,247	19.0
	Dec.	4,688	3,222	18.9
1976	Total	79,916	3,212 (ave)	19.0 (ave)
1977	Jan.	7,249	3,229	18.7
	Feb.	5,302	3,258	18.5
	March	4,775	3,266	18.8
	April	4,275	3,303	17.8
	May	4,775	3,336	17.9
	June	8,552	3,362	18.6
	July	9,795	3,382	17.4
	Aug.	11,442	3,495	17.5
	Sept.	11,083	3,477	18.1
	Oct.	6,375	3,420	17.3
	Nov.	5,061	3,392	17.1
	Dec.	3,836	3,395	15.4
1977	Total	82,520	3,360 (ave)	17.8 (ave)

is far from the 100 percent increase of December. Therefore, only data from December 1976 was deleted.

Second, the cases were deleted in which the monthly enlistments in a county were zero, because including them resulted in a distribution which was abnormally skewed and leptokurtic. Deleting the cases in which there were no enlistments also restricted the analysis to the contribution of advertising and the other independent variables when enlistments occurred, which this study has defined as effective.

Finally, when the total monthly enlistments were normalized by dividing by the county's QMA, the distribution shown in Table VI resulted. A small number of cases in the extreme right tail of the distribution indicated a higher enlistment rate than the bulk of the cases in the rest of the distribution. This exceptionally high rate of enlistment started at about .005 enlistments per QMA; therefore, these 682 cases were considered outliers and were deleted from the study.

Table VII shows the results of an investigation of the variables in the cases remaining in the study and the cases considered outliers, zero enlistments and enlistments per QMA exceeding .005. The only significant differences noted in the variables were the QMA and the number of high school graduates. The outlier cases occurred in smaller counties where zero and unusually high enlistment rates were more probable.

Table VIII shows the parameters of the raw enlistment distribution and the normalized enlistment rate distribution before and after the deletions of the outliers. Of the 73,766 counties-by-month cases, 33,175 total enlistment cases and 22,844 HSG/AFQT50 cases remained for analysis. Fewer cases of HSG/AFQT50 remained because the number of cases of zero enlistments of these quality enlistees was larger. The distributions show

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TABLE VI

DISTRIBUTION OF TOTAL MONTHLY ENLISTMENTS PER QMA

INTERVAL	FREQUENCY	CUMULATIVE FREQUENCY
Less than .0005	7,973	23.6
.0005 to .0010	11,936	58.8
.0010 to .0015	6,083	76.8
.0015 to .0020	2.979	85.6
.0020 to .0025	1,586	90.3
.0025 to .0030	1,065	93.4
.0030 to .0035	649	95.3
.0035 to .0040	402	96.5
.0040 to .0045	281	97.4
.0045 to .0050	221	98.0
.0050 to .0055	158	98.5
.0055 to .0060	116	98.8
Greater than .0060	408	100.0

TABLE VII

COMPARISON OF MEANS AND STANDARD DEVIATIONS OF VARIABLES OF CASES
INCLUDED IN THE STUDY WITH OUTLIER CASES

VARIABLE	ZERO ENLISTMENTS	CASES INCLUDED	ENLISTMENTS/QMA>.005
QMA	928 (1091)	7851 (19507)	376 (394)
High School Graduates	237 (224)	1798 (4181)	128 (131)
Goals/QMA	.00054 (.00021)	.00053 (.00021)	.00054 (.00020)
Canvassers/QMA	.00026 (.00005)	.00026 (.00005)	.00029 (.00005)
Media/QMA	.026 (.043)	.028 (.061)	.029 (.078)
LAMS/QMA	.009 (.006)	.008 (.006)	.009 (.006)
RAD aids/QMA	.049 (.037)	.049 (.038)	.050 (.033)

NOTE: Mean/(Standard Deviation)

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TABLE VIII

PARAMETERS OF ENLISTMENT DISTRIBUTIONS BEFORE AND AFTER DELETION OF OUTLIERS

DESCRIPTION	MEAN	STD DEV	KURTOSIS	SKEWNESS	OBSERVATIONS
Before Deletion					
Total Enlistments	2.5	8.6	480	15.7	73,776
Total HSG/AFQT50	1.2	4.2	396	14.2	73,776
Total Enlistments/QMA	.00063	.0013	357.3	11.9	73,776
Total HSG/AFQT50/QMA	.00028	.0008	191.8	9.6	73,776
After Deletion					
Total Enlistments	5.1	11.1	189	10.6	33,175
Total HSG/AFQT50	3.5	6.3	138	8.8	22,844
Total Enlistments/QMA	.0011	.0009	3.4	1.8	33,175
Total HSG/AFQT50/QMA	.0007	.0007	7.5	2.4	22,844

less skewness and less kurtosis after the deletion of the outliers, and the enlistment rate distributions were now almost normal.

2. Advertising

It was recognized that advertising in the months prior to an enlistment might have an effect not included in the analysis. Therefore, lagged advertising variables of one and two months were added to the current month's advertising for each county to allow for the effect of advertising in previous months on the current month's enlistments. The decision of how many months of lagged advertising to include was decided by conducting the analysis with up to five months of lag. This analysis showed that the results of the regression were not significantly different when more than two months of lagged advertising were included. Hence, lagged advertising variables of one and two months were included. Using two months of lagged advertising data reduced the number of cases of total enlistments in the analysis to 30,083 and the number of cases of HSG/AFQT50 to 20,656.

Distributing quarterly LAMS and RAD aid expenditures equally among the three months in the quarter meant that lagged LAMS and RAD aid expenditures were often equal to the expenditures for the current month. In the cases with LAMS and RAD lagged one month, the lagged expenditure would be different from the current expenditure only when the current month was the first month in a quarter, which should have occurred in only one out of three cases. Similarly, when LAMS and RAD were lagged two months, the lagged expenditures would be different from the current expenditure when the current month was the first or second month in a quarter, which should have occurred in two out of three cases. Lacking monthly LAMS and RAD aid expenditures, this assumption about their

distribution from quarterly expenditures might affect the results with LAMS and RAD lagged one month since they were so often equal to the current LAMS and RAD expenditures.

The total monthly expenditure for media in each county was used in the regression analysis, because the individual media category expenditures were not continuous throughout the two-year period of the study as shown in Table III. Magazine advertising was the only media with advertising every month (except July 1977), but magazine expenditures were much lower monthly in 1977 than in 1976 due to the shift from magazines to radio in November 1976 and then to television in April 1977. Mail and outdoor expenditures were seasonal with mailouts prevalent during the school year and outdoor found only during the spring and summer months. Finally, a fourth advertising variable, the total advertising each month in each county, was created by summing the total media, the LAMS, and the RAD aid expenditures. This total advertising expenditure was also lagged for one and two months.

3. Variables in the Model

Table IX is a summary of the variables which were considered for inclusion in the enlistment models. The data from December 1976, from cases with zero enlistments, and from cases with an enlistment rate greater than .005 have been deleted. A dummy variable, YR, which has the value "1" in 1976 and "0" in 1977, was created to account for the differences in media allocations between the two years. In addition, the ratio of the number of canvassers to the Q goal in a county was felt to be important. A variable, CANGOL, was created to represent this ratio. The unemployment rate has been multiplied by the QMA in each county to determine the approximate number of unemployed who were eligible for

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TABLE IX

SUMMARY OF VARIABLES IN THE ENLISTMENT MODELS

VARIABLE DESCRIPTION	REGRESSION NAME	MEAN	STANDARD DEVIATION
Total Enlistments	TOTENL	5.1	11.1
Graduate Enlistments above 50th %	GRAD50	3.5	6.3
Total Media Advertising	TOTMED	283.2	1058.0
Total LAMS	TOTLAM	66.1	210.7
Total RAD aids	TOTRAD	390.4	1799.3
Total Advertising	TOTAD	739.8	2676.1
Q Goal	GOAL	4.3	11.6
Number Canvassers	CANV	2.0	5.0
Canvassers per Q Goal	CANGOL	0.5	0.2
QMA	QMA	7971.1	19673.1
Number High School Graduates	GRAD	1818.5	4210.1
Number Unemployed QMA	UNEMQM	1452.8	3590.5

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enlistment vice an unemployment rate which was constant for all counties each month. This number of unemployed was also lagged one month.

4.   Normalization and Transformation of Variables

Table X shows the correlation matrix for the variables which were considered for a linear, least squares enlistment model of the following form:

Enlistments = f(Advertising, Goals, Canvassers, Graduates, QMA, Unemployed)

However, the correlation matrix points out a problem with the recruiting variables picked for this model, multicolinearity. The high intercorrelations among the variables indicates the need for a modification to the model. The modification decided upon was normalization of the variables by dividing them by QMA.

The multicolinearity found among the recruiting variables is the result of what has been called the simultaneity problem. This is the case when relationships among the variables do not vary naturally, but are fixed or moderated by some decision of management. For example, in the civilian sector, management projects sales on the basis of production and marketing plans, and advertising is then allocated accordingly. In short, sales determine advertising. In the case of Navy recruiting, the Navy Recruiting Command determines the enlistments (sales) needed and then allocates the goals and resources, including advertising, to produce these enlistments. The target population in an area, QMA, is the key factor for determining this allocation. Therefore, the intercorrelation of the recruiting variables is the result of their common determinant, QMA.

Division of each variable by the county's QMA resulted in the correlation matrix shown in Table XI. Normalization with QMA has reduced

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TABLE X

CORRELATION AMONG VARIABLES REPRESENTING RAW DATA

	TOTENL	TOTMED	TOTLAM	TOTRAD	TOTAD	GOAL	CANV	QMA	GRAD	UNEMQM
TOTENL	1.00	.66	.74	.52	.67	.91	.93	.92	.93	.93
TOTMED		1.00	.64	.56	.82	.66	.72	.74	.71	.73
TOTLAM			1.00	.47	.65	.76	.81	.83	.80	.82
TOTRAD				1.00	.93	.49	.58	.62	.59	.62
TOTAD					1.00	.65	.74	.77	.74	.77
GOAL						1.00	.93	.92	.90	.92
CANV							1.00	.98	.96	.98
QMA								1.00	.97	1.00
GRAD									1.00	.96

the multicolinearity. The dependent variable, enlistments per QMA, is

a measure of the monthly enlistment rate for each county, and it provides

a comparison of the recruiting effectiveness of all counties. The enlist-

ment model was now of the form:

$$\frac{Enlistments}{QMA} = f\left(\frac{Advertising}{QMA}, \frac{Goals}{QMA}, \frac{Canvassers}{QMA}, \frac{Graduates}{QMA}, Unemployment\ Rate\right).$$

While normalization with QMA has helped the multicolinearity pro-

blem, it has made the relation between enlistment rate and the advertising

rate nonlinear. An example is shown in Table XII for total advertising. A

transformation was required which would help make this relation linear so

that advertising could be included in the linear model with enlistment rate.

The transformation which proved to be the most effective was taking the

fourth root of the advertising expenditure before dividing by QMA. The re-

lation between enlistment rate and total advertising rate after the trans-

formation is also shown in Table XII. The other advertising variables were

all transformed in the same way. None of the other independent variables

exhibited the nonlinearity problem with enlistment rate, and no other

transformations were performed on any variables except advertising. Table

XIII is the correlation matrix with the transformed advertising variables,

which are indicated by the number "4" in the variable name.

Index correlation is now a possible source of error in correla-

tion, because the variables are all ratios with a common variable denomina-

tor, QMA. However, it was felt that this was an instance when it was ne-

cessary to do an analysis of the interrelations of the ratios knowing in-

dex correlation was present.

Table XIV is a summary of the variables which were considered for the

enlistment rate model. The dummy variable, YR, is again used, and the variables

TABLE XI

CORRELATION AMONG VARIABLES AFTER NORMALIZATION

	ENLQMA	MEDQMA	LAMQMA	RADQMA	ADQMA	GOLQMA	CANQMA	GRADQM	UNEMP
ENLQMA	1.00	.01	.05	.00	.01	.05	.10	.33	.01
MEDQMA		1.00	.03	.04	.86	-.04	.02	.05	-.01
LAMQMA			1.00	-.15	.02	.13	.24	.00	-.18
RADQMA				1.00	.54	-.20	.02	.01	.19
ADQMA					1.00	-.12	.05	.04	.08
GOLQMA						1.00	.39	.07	.11
CANQMA							1.00	.10	-.07
GRADQM								1.00	.00

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TABLE XII

JOINT DISTRIBUTION OF TOTAL ENLISTMENTS/QMA WITH TOTAL ADVERTISING/QMA BEFORE AND AFTER FOURTH ROOT TRANSFORMATION OF ADVERTISING

BEFORE TRANSFORMATION

$\dfrac{\text{ENLISTMENTS}}{\text{QMA}}$

.002	212	557	334	193	94
.001	431	1080	596	375	179
	880	2166	1221	744	398
	1805	4308	2524	1406	906
0	1238	2846	1684	1012	607

0 · · · .08 · · · .16

$\dfrac{\text{Total Adv}}{\text{QMA}}$

AFTER TRANSFORMATION

$\dfrac{\text{ENLISTMENTS}}{\text{QMA}}$

.002	322	521	425	122
.001	939	990	718	14
	2876	2224	309	0
	8209	2734	6	0
0	7332	55	0	0

0 · · · .004

$\sqrt[4]{\dfrac{\text{Total Adv}}{\text{QMA}}}$

TABLE XIII

CORRELATION AMONG VARIABLES AFTER NORMALIZATION AND TRANSFORMATION

	ENLQMA	MED4QM	LAM4QM	RAD4QM	AD4QM	GOLQMA	CANQMA	GRADQM	UNEMP
ENLQMA	1.00	.69	.72	.72	.73	.05	.10	.33	.01
MED4QM		1.00	.90	.91	.96	.00	.08	.34	.08
LAM4QM			1.00	.91	.94	.05	.12	.32	-.05
RAD4QM				1.00	.98	-.02	.07	.31	.05
AD4QM					1.00	-.01	.08	.33	.03
GOLQMA						1.00	.39	.07	.11
CANQMA							1.00	.10	-.07
GRADQM								1.00	.00

for unemployment, UNEM and UNEM1, are the actual unemployment rates for
the current month and for the previous month.

TABLE XIV

SUMMARY OF VARIABLES AFTER NORMALIZATION AND TRANSFORMATION

VARIABLE DESCRIPTION	REGRESSION NAME	MEAN	STANDARD DEVIATION
Enlistments/QMA	ENLQMA	.0011	.0009
Graduate Enlistments above 50th %/QMA	GR50QM	.0005	.0006
$\sqrt[4]{\text{Total Media/QMA}}$	MED4QM	.0013	.0012
$\sqrt[4]{\text{Total LAMS/QMA}}$	LAM4QM	.0010	.0009
$\sqrt[4]{\text{Total RAD/QMA}}$	RAD4QM	.0016	.0014
$\sqrt[4]{\text{Total Advertising/QMA}}$	AD4QM	.0019	.0017
Q GOAL/QMA	GOLQMA	.0005	.0002
Number Canvassers/QMA	CANQMA	.0003	.0000
Number Graduates/QMA	GRADQM	.2586	.0877
Unemployment Rate	UNEMP	.1823	.0093

III. RESULTS

A. STEPWISE MULTIPLE REGRESSION

The stepwise multiple regression feature of the SPSS routine, RE-
GRESSION, was used to perform a linear, least squares fit to the data
with the enlistment rate models. The regression was allowed to continue
as long as the F statistic for the next variable to enter was signifi-
cant at the .01 level, and as long as the adjusted R square continued
to increase with the entry of these variables. The variables are shown
in the documentation in the order in which they entered the regression
equations.

The regression was performed first with the total enlistment rate
as the dependent variable and then with the enlistment rate of HSG/AFQT50
as the dependent variable. The lagged advertising variables are indicated
by the number 1 or 2 in the variable name representing one or two months
of lag.

B. ENLISTMENT RATE MODELS

Table XV is a summary of the stepwise regression of the normalized
data with total enlistments per QMA as the dependent variable. The total
advertising per QMA two months prior to an enlistment was the first var-
iable to enter the equation and was the most significant along with LAMS
and RAD aids expenditures per QMA for the current month. However, the
total advertising per QMA for the current month entered the equation with
a negative coefficient as did LAMS expenditures per QMA the month before
an enlistment. The proportion of high school graduates to QMA and the

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total media expenditures per QMA for the current month were also significant according to their terminal F ratios and their Beta coefficients. The proportion of canvassers to QMA and the unemployment rate, which entered with a negative coefficient, were not significant factors. The monthly Q goal per QMA did not enter the equation.

The model explained 56 percent of the variance in the total enlistment rate. The dummy variable, YR, entered the equation, which indicated a higher enlistment rate in 1976 than in 1977 for which none of the other independent variables in the model could account.

Stepwise regression was performed with the normalized data and the enlistment rate of quality enlistees as the dependent variable with the results shown in Table XVI. The results were similar to the results with the total enlistment rate except that advertising was even more significant. The number of high school graduates and the dummy variable for the year remained significant in this model, but the number of canvassers did not enter this equation, and the unemployment rate was once again found to have a negative coefficient. Total advertising lagged two months was again the first variable to enter. It was noted that the current media, current LAMS, and current RAD aids all entered the equation with a positive coefficient while the total advertising expenditure for the current month entered with a negative coefficient. This was also true for advertising lagged one month. This supported the idea that the way advertising money was spent was more important than the amount which was spent. The model accounted for 74 percent of the variance in the rate of enlistment of high school graduates scoring above the 50th percentile on the AFQT.

TABLE XV

STEPWISE MULTIPLE REGRESSION OF TOTAL ENLISTMENTS (ENLQMA)

VARIABLE	COEFFICIENT	BETA	F AT ENTRY	TERMINAL F
AD24QM	.16	.31	34,213	289
LAM4QM	.22	.25	655	155
GRADQM	.0009	.09	531	475
RAD4QM	.16	.27	150	61
YR	.00009	.05	100	110
CANQMA	.50	.03	56	53
MED4QM	.09	.14	24	30
UNEMP	−.00002	−.03	20	23
LM24QM	.11	.13	15	37
LM14QM	−.12	−.13	22	24
AD4QM	−.12	−.24	14	14
Constant	.0004			

Adjusted R Square = .556   F = 3138

Standard Error   = .00057   d.f. = 11/30071

TABLE XVI

STEPWISE MULTIPLE REGRESSION OF QUALITY ENLISTMENTS (GR50QM)

VARIABLE	COEFFICIENT	BETA	F AT ENTRY	TERMINAL F
AD24QM	.18	.39	51,513	228
LAM4QM	.19	.23	972	225
RAD4QM	.18	.34	247	117
YR	.00008	.06	249	175
GRADQM	.0004	.05	191	159
MED4QM	.13	.21	48	74
LM24QM	.07	.09	38	35
AD4QM	-.17	-.36	26	37
UNEMP	-.00001	-.02	17	11
CANGOL	.00003	.01	9	9
ME24QM	-.02	-.04	5	5
Constant	.0002			

Adjusted R Square = .737   F = 5269.8

Standard Error   = .00035   d.f. = 11/20644

The standard error, or variance, of these enlistment rate models is low because of the large sample size. The analysis of the residuals and the Durbin-Watson statistics of about 1.7 in each case indicated that serial correlation was not present.

C. ENLISTMENT RATE MODELS LESS TOTAL ADVERTISING VARIABLES

The variables created to represent the total monthly advertising (media + LAMS + RAD aids) were deleted from a stepwise regression analysis of the enlistment rate models after seeing the results of the analysis which included the total advertising variables. The total advertising variable was deleted to determine which components, if any, of the total advertising variable lagged two months were significant. In addition, the difference in signs between the coefficients of total advertising and its components was a second reason to perform the regression without total advertising variables. It was hoped the results of this analysis, without the total advertising variables, would provide a better evaluation of the contribution of the component variables.

Tables XVII and XVIII show the results of this regression of the enlistment rate models without the total advertising variables. In both cases the media, LAMS, and RAD aids (current month and lagged two months) entered the equation with positive coefficients. Thus the three components of total advertising were significant with positive coefficients in contrast to the negative coefficient of total advertising. Therefore, the results were in agreement with the proposition that effective advertising is determined by how the money is spent (media, LAMS, RADS aids) and not by the total expenditure.

TABLE XVII

STEPWISE MULTIPLE REGRESSION OF TOTAL ENLISTMENTS (ENLQMA)

WITHOUT TOTAL ADVERTISING VARIABLES

VARIABLE	COEFFICIENT	BETA	F AT ENTRY	TERMINAL F
LAM4QM	.20	.22	32,237	134
RAD4QM	.08	.14	1,378	71
GRADQM	.0009	.09	587	473
ME24QM	.05	.07	242	42
RD24QM	.12	.20	66	141
YR	.00009	.05	77	108
CANQMA	.51	.03	57	55
MED4QM	.05	.07	42	44
LM24QM	.14	.12	38	55
UNEMP	-.00002	-.02	23	24
LM14QM	-.11	-.12	22	22
Constant	.0004			

Adjusted R Square = .556   F = 3419.4

Standard Error   = .00057   d.f. = 11/30071

TABLE XVIII

STEPWISE MULTIPLE REGRESSION OF QUALITY ENLISTMENTS (GR50QM)

WITHOUT TOTAL ADVERTISING VARIABLES

VARIABLE	COEFFICIENT	BETA	F AT ENTRY	TERMINAL F
LAM4QM	.16	.20	47,507	173
RAD4QM	.08	.14	1,977	81
ME24QM	.04	.06	410	33
GRADQM	.0004	.05	166	161
YR	.00008	.06	146	173
RD24CM	.12	.23	140	200
MED4QM	.06	.10	88	88
LM24QM	.10	.13	73	76
UNEMP	-.00001	-.01	12	8
CANGOL	.00003	.01	8	8
Constant	.0001			

Adjusted R Square = .737   F = 5784.8

Standard Error   = .00035   d.f. = 10/20645

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D. SUMMARY OF RESULTS

The final enlistment rate models resulting from the regression analysis indicated that advertising was a significant contributor to the determination of the monthly enlistment rate at the county level. The two models, total enlistment rate and the enlistment rate of quality enlistees, are shown below with their significant independent variables.

Total Enlistment Rate

$$ENLQMA = .0004 + .0009GRADQM + .00009\ YR + .5\ CANQMA$$
$$+ .20\ LAM4QM + .08\ RAD4QM + .05\ MED4QM$$
$$+ .14\ LM24QM + .11\ RD24QM + .05\ ME24QM$$

Enlistment Rate of Quality Enlistees

$$GR50QM = .0001 + .0004\ GRADQM + .00008\ YR$$
$$+ .16\ LAM4QM + .08\ RAD4QM + .06\ MED4QM$$
$$+ .10\ LM24QM + .12\ RD24QM + .04\ ME24QM$$

The two models indicated that the amount of advertising, the kind of advertising (media, LAMS, RAD aids), and the timing of advertising were important in determining the enlistment rate. Media advertising, LAMS, and RAD aids expenditures during the current month and during the second lagged month were significant, while the advertising during the first lagged month was not. As discussed previously, in two of three cases the LAMS and RAD expenditures for the current month and for the first lagged month were equal as compared with one of three cases for the current month and for the second lagged month. This might have contributed to the greater significance of LAMS and RAD aid expenditures lagged two months. Considering the coefficients above and the Beta

coefficients in Tables XVII and XVIII, LAMS expenditures were more signifi-
cant the month of the enlistment, RAD aids expenditures were more signifi-
cant during the second lagged month, and media expenditures were equally
significant during both months. The proportion of high school graduates
was significant in both models, but the proportion of canvassers in a
county was significant only in the total enlistment rate model. The dummy
variable, YR , appeared in both models and indicated a higher enlistment
rate in 1976 which was not explained by the variables in the model.

IV. DISCUSSION

The analysis of the enlistment rate models showed advertising varia-
bles were significant in the determination of the enlistment rate with
respect to both a quantity and a quality measurement of effectiveness.
Therefore, the advertising which appeared as variables in these models
was effective. In arriving at these models, those counties without an
enlistment in a particular month were excluded along with those counties
with an exceptionally high enlistment rate. Over half of the cases in-
vestigated in this study were cases with zero enlistment; therefore, a
model which included these cases would add information to improve the
results found here without them.

An important outcome of the advertising variables which appeared
in the enlistment rate models was that the amount spent is not important
if the type of advertising and the timing of the advertising are not
taken into account. The fourth root transformation of advertising needed
to make a linear relation with enlistment rate was indicative of the
small effect a large advertising rate produced. It was also noted in the
enlistment rate of quality enlistees that the sum of media, LAMS, and
RAD aids expenditures was not a positive contributor to the enlistment
rate, but the three types of advertising were each positive contributors
when considered separately. Finally, the lagging of the advertising re-
vealed that each type of advertising was more effective at certain times
than it was at others. RAD aids were most significant two months prior
to an enlistment, LAMS expenditures were most significant the month of
an enlistment, and media advertising was most significant two months
prior to and the month of an enlistment.

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LAMS advertising lagged one month entered the total enlistment model with a negative coefficient and was the only advertising lagged one month to enter the equations. This indicated a possible two-phased effect. In the first phase an attitude change due to media advertising and RAD aids used two months prior to the enlistment led to a visit to a recruiter's office. The second phase involved the sale of an enlistment by a recruiter with the help of LAMS expenditures and more media advertising.

The important finding about the non-advertising variables was the lack of importance of the canvassers per QMA and unemployment in both models and the failure of the monthly Q goal per QMA to enter the equation in either model. When the study was started, the monthly Q goal was expected to be the major determinant of the monthly enlistments. However, this did not prove to be supported by the analysis. Its failure to enter the enlistment rate models indicated that the monthly status of the DEP (Delayed Entry Program) pool should be considered in addition to the Q goal. Enlistments into DEP accounted for the majority of enlistments and allowed recruiters to start filling Q goals up to a year prior to the month of the goal.

The drop in significance of the proportion of canvassers in a county in the models with quality enlistees could be traced to the raw data in Tables II and V. Comparing 1976 and 1977, excluding December in both years, the enlistment figures in Table II indicate that total enlistments dropped 7.5 percent in 1977, while the enlistment of high school graduates scoring above the 50th percentile on the AFQT dropped 19.5 percent in 1977. On the other hand, Table V shows the average number of canvassers per month increased 4.5 percent in 1977. Thus, the

proportion of canvassers was less significant in the quality enlistee

models due to this large drop in enlistments with an increase in can-

vassers.

The unemployment rate might be more significant if the national rate

used in this study had been available at the county level or at some dis-

aggregated level below the national level. In addition, the unemployment

rate was nearly constant for the two years, varying between 19 percent

and 17 percent; however, this slight decline during the two years matches

a similar decline in enlistments.

Unemployment rates were not the only data in which aggregation was

a problem in conducting this study at the county level with monthly data.

Actually, enlistments were the only data available at this low level of

aggregation. The QMA for each county was an extrapolation from aggregated

data for about 400 sections of the country. While the number of high

school graduates was available for each county, the number sometimes in-

cluded graduates who lived in one county but attended high school in

another county. Therefore, there were a few cases of counties with no

high school graduates. The high correlation between QMA and high school

graduates indicates both data sources were reasonably accurate.

The most serious shortages of data needed at the county-monthly level

were the LAMS and RAD aids expenditures, the number of canvassers, and

the Q goal. The methods used in this study were based on the recruiting

practice of allocating resources according to QMA, and, hopefully, the

results were close to the actual distribution. The LAMS and RAD aids

allocation procedure of dividing the expenditure for a quarter into three

equal monthly expenditures was the largest disaggregation estimate, and

the one most subject to error.

While the results of the analysis indicated a significant relation-
ship between enlistment rate and advertising rate, the models used were
not able to determine the direction of influence between advertising and
enlistments. The questions remained "Was advertising effective in pro-
ducing enlistments?" of "Were enlistments actually driving the efficient
distribution of advertising?" A final step in the analysis was added
to seek more information about this direction of influence using the Re-
cruitment Development Index (RDI), a measure of the relative potential of
an area for enlistments. This RDI was computed as shown below:

$$RDI = \frac{\text{Enlistments (county)/Enlistments (total)}}{\text{QMA (county)/QMA (total)}}$$

The RDI is a widely used basis for assigning recruiting resources such
as canvassers, goals, and advertising.

Table XIX shows the results of a correlation analysis of RDI with the
raw recruiting data and with the data after normalization and transforma-
tion. The negative correlation of RDI with all of the raw data variables
indicated that the counties with the higher RDI were the ones receiving
the smaller gross amounts of advertising, recruiters, and goals. The
second correlation matrix, with the data used in the enlistment rate models,
shows nearly the same correlations with RDI as those obtained previously
with the enlistment rate, enlistments per QMA. This indicated the close
relationship between advertising per QMA and canvassers per QMA assigned
to a county and its RDI. More analysis is required to explore this rela-
tionship between advertising expenditures and the RDI and, also, to in-
vestigate the direction of influence between advertising and enlistments.

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TABLE XIX

CORRELATION OF RECRUITMENT DEVELOPMENT INDEX (RDI)
WITH RAW DATA AND ENLISTMENT RATE DATA

.

RAW DATA

	RDI	GOAL	CANV	TOTMED	TOTLAM	TOTRAD
RDI	1.00	-.19	-.20	-.13	-.16	-.12
GOAL		1.00	.93	.66	.76	.50
CANV			1.00	.71	.81	.58
TOTMED				1.00	.64	.56
TOTLAM					1.00	.48

ENLISTMENT RATE DATA

	RDI	COLQMA	CANQMA	MED4QM	LAM4QM	RAD4QM
RDI	1.00	-.01	.11	.70	.72	.72
GOLQMA		1.00	.39	.01	.06	-.02
CANQMA			1.00	.08	.14	.08
MED4QM				1.00	.90	.91
LAM4QM					1.00	.91

V. CONCLUSIONS

This study showed that Navy advertising was effective as one of the determinants of the enlistment rate, enlistments per Qualified Military Available (QMA). Three aspects of advertising must be considered when allocating expenditures for advertising: the amount of advertising, the type of advertising, and the timing of advertising. The enlistment rate was a function of the fourth root of advertising which indicates a large change in expenditure for advertising for a small change in enlistment rate. The three types of advertising, media (television, radio), Local Advertising Management System (LAMS), and Recruit Advertising Department (RAD) aids were all significant in the enlistment rate models. However, RAD aids were most effective two months prior to the enlistment, LAMS expenditures were most effective the month of the enlistment, and media advertising was most effective in both the month of the enlistment and two months prior to the enlistment. These results were the same for models of the quantity of enlistments, total enlistments, and for models of the quality of enlistments, high school graduates scoring above the 50th percentile on the Armed Forces Qualification Test (HSG/AFQT50).

In addition to the significance of advertising in the recruiting effort, the study showed that the proportion of high school graduates to QMA in a county was a significant factor in both the total enlistment rate and the quality enlistment rate, but the proportion of recruiters to QMA in a county was significant only in the case of total enlistments. The monthly goal of enlistees to be sent to recruit training, the Q goal, per QMA was not significant. This was attributed to the impact of the

Delayed Entry Program (DEP), which allows recruiters to start filling
these Q goals up to a year before the goal must be met. The national
unemployment rate was not a significant factor in the enlistment rate
models. The model used in the study does not provide a definitive deter-
mination of the direction of the affect between enlistments and advertising,
whether advertising resulted in enlistments or expected enlistments re-
sulted in advertising.

VI. RECOMMENDATIONS

1. Data directly from the county-monthly level is needed to re-place the LAMS, RAD aids, Q goals, and recruiters estimated from data at the Naval Recruiting District Level. The unemployment rate should also be determined at some level below the national rate used in this study.

2. The effectiveness of each of the national media categories (television, radio) should be examined as a result of the significance of total media advertising found in this study.

3. A model is needed which includes the cases of zero enlistments excluded by this study.

4. The Delayed Entry Program (DEP) pool should be included as a factor in addition to the Q goal which drives enlistments.

5. Analysis with appropriate models is required to determine the direction of influence between advertising and enlistments.

6. The optimal relationship between advertising expenditures and the potential of a territory as measured by an indicator such as the Recruitment Development Index (RDI) requires investigation.

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